ANDERSON, A. W., R. B. CARLSON, and R. SCHLECHT, Department of Entomology, Hultz Hall, North Dakota State University, Fargo, ND 58105, and Pembina County Extension Office, Cavalier, ND 58220. - Drought and sugarbeet root maggot population levels in the Red River Valley.

ABSTRACT

The effect of seasonal weather patterns on emergence and population levels of the sugarbeet root maggot (SBRM) has been studied over 22 years. The data accumulated from 1970-85 provided the basis for advanced forecasts of expected population levels as well as accurate prediction of emergence patterns. Severe drought conditions beginning in the fall of 1987 through the 1989 growing season significantly enhance the data base and provide new information on SBRM emergence patterns.

The monitoring program has been conducted on five individual farming operations in Pembina County near Cavalier, ND, an area where SBRM problems first occurred in the 1950s and continue to this date. All five farms are within 5 miles of a weather reporting station from which weather data was obtained. SBRM adults are trapped in modified Japanese beetle traps baited with sugar water plus Dylox. At each farm, five Japanese beetle traps were placed in the previous season's beet fields. The traps were serviced and flies counted daily, where possible, during the peak SBRM fly activity and at 2 or 3 day intervals at other times.

Analysis indicates weather factors during the previous early summer (June-July) and the current spring (April - May) can be related to population levels. High temperatures and low rainfall during early summer were associated with lower SBRM adult counts the following year. High spring temperatures and low rainfall were associated with lower counts over the current season. Optimal conditions for SBRM survival and development, then, include moderate temperatures along with moderate to high rainfall over both yearly periods.

Optimal weather conditions occurred over both 'critical' periods in 1985, 1986, and 1987 prior to the drought. SBRM populations increased over this period. Adding to this increase may have been a general reduction in rates of insecticide used, for economic reasons, by growers in this area along with a general lack of attention to calibration.

Drought conditions began in the fall of 1987 through the 1989 growing season. The most serious result was a significant reduction in sub-soil moisture in all areas of the Valley. During this period, however, nominal rainfall and temperatures were evident over both 'critical' periods and SBRM population levels remained high during the drought. Sufficient moisture was available for adult emergence, oviposition, and early establishment of SBRM larvae on the beet root. The problem was further compounded by a change in SBRM adult emergence patterns during this period. Normal SBRM emergence occurs in early June with a single peak of emergence generally around June 10-15. During the drought years two peaks were evident with a minor peak in early June followed by major population emergence in late June.

Control of this insect during the drought may have been limited by a combination of factors. Low soil moisture levels generally result in reduced control with granular insecticides under dry land conditions. Further, the major peak of adult emergence and oviposition occurring late in June significantly extends the required longevity of active insecticide in the soil. This would be most important in early planted beets (April 15) which would require the active life of these insecticides to extend beyond 90 days. Depleted sub-soil moisture levels generally dry soil conditions, and higher temperatures through late summer would severely limit extended active life of the insecticides.

Heavy winter snowfall and generous spring rainfall ended the drought in the Cavalier area by the spring of 1991. This was a year of record high SBRM populations levels. Planting time activities were slowed by wet conditions with most beets planted from May 15 through May 25, 1991. The entire growing season was wet and mild. Single planting time insecticide applications in this area effectively reduced SBRM damage and commercial yields in this area were the highest for the Valley. Most significantly, 1992 SBRM population levels in the monitored fields near Cavalier were reduced by 50%.